REMARKS

Reconsideration of the issues raised in the above referenced Office Action is respectfully solicited.

Referring to the Office Action, the objection to the Abstract has been considered. The Abstract has been revised to remove legal phraseology and to better describe the invention. Approval of the amended Abstract is respectfully requested.

The objections to the disclosure have been considered. The disclosure has been amended to address the informalities listed in the Office Action and to provide proper subject headings. Further, other informalities have been addressed such as deleting the references to the claims in the Summary section. Approval of the amended specification is respectfully requested.

The rejection of Claims 4, 10, 13 and 14 under 35 USC §112, second paragraph has been considered.

The term "preferably" has been deleted from Claims 4, 10, 13 and 14 to address the Examiner's rejection. Further, reference numerals have been deleted from Claims 1-18 and the phrase "characterized in that" in the claims has been changed to ---wherein--- to better correspond to USPTO claim format. Finally, other minor informalities have been addressed by amendment.

Reconsideration and withdrawal of the rejection of Claims 4, 10, 13 and 14 under 35 USC §112, second paragraph, as being indefinite is respectfully requested.

The rejection of Claims 1, 4, 9, 15, 16 and 18 under 35 USC §103 as being unpatentable over Foerster, U.S. Patent No. 3 444 613 has been considered.

Foerster discloses a method of joining carbide to steel. Specifically, Foerster discloses joining carbide tips, inserts and the like to shanks, dies or the like. To join the steel shank and cutting head a mixture of nickel powder and an alloy powder formed as a disc or wafer is interposed between the carbide tip and the shank. The assembly is then heated to cause the disc or wafer to join the elements by brazing. As disclosed at column 2, lines 29-32 of Foerster, the use of a

structure chiefly of nickel with regulated porosity can "absorb stresses formed on cooling, due to the differences in linear expansion of the martensitic die steel shank and the carbide tip". The regulated porosity refers to the blended powders. The regulated porosity presumably is homogeneous throughout the wafer or disc. Thus, Foerster discloses the basic concept of having a tool shank and carbide tip that are joined by a wafer, disc or other element by induction brazing at a high temperature. Therefore, the basic concept of brazing to join element is disclosed by Foerster.

Applicant's Claim 1 is directed to the same general concept as Foerster. Claim 1, however, further recites a joining layer for joining the tool shank and cutting head made of ductile brazing material at joining surfaces and "powder particles made of a temperature-resistant material having a lower coefficient of thermal expansion than the brazing material being embedded in the joining layer, wherein the joining layer has a different coefficient of thermal expansion over its layer thickness, the coefficient of thermal expansion being lower on the side of the cutting head than on the side of the tool shank". Thus, Applicant's Claim 1 emphasizes the different coefficients of thermal expansion over its layer thickness, and specifically the coefficient of thermal expansion being "lower on the side of the cutting head than on the side of the tool shank". This difference in the coefficient of thermal expansion is not disclosed in Foerster. There is no disclosure or suggestion anywhere in Foerster of having a different coefficient of thermal expansion at different sides of the joining layer. "Regulated porosity" in view of the disclosure of creating the preforms in Foerster simply amounts to a uniform powder mixture for the joining disc.

The Office Action states that Foerster discloses the claimed invention except for the joining layer having a different coefficient of thermal expansion over its layer thickness. The Office Action states that it would have been obvious to one of ordinary skill in the art to "vary the coefficient of thermal expansion across the layer thickness,

for the purpose of reducing the thermal stresses at the specific material interfaces, thus improving the adjoining connection, by best matching the coefficient of thermal expansion of the layer thickness interface with that of the respective adjoining material compositions because it has been held that discovering an optimum value of a result effective variable involves only routine experimentation".

In Foerster, one can assume that the mixture forming the wafer or disc is evenly mixed since no where in the document is there reference to any type of uneven mixture. Moreover, there is no disclosure of the joint layer of Foerster having a varying heat expansion coefficient over its layer thickness, much less a smaller heat expansion coefficient on the side of the cutting head than on the side of the tool shaft.

Instead, Foerster merely discloses choosing the porosity of the joining element in view of the linear expansion of the steel shank and carbide tip.

In view of the above, there is no motivation to provide the joining layer of Foerster with a different coefficient of thermal expansion over its layer thickness. The Office Action states that the discovering of an optimum valve of a result effect variable involves only routine experimentation. Applicant does not necessarily disagree with this statement, but in this instance the statement does not apply. There is no disclosure in Foerster of varying the different coefficient of thermal expansion over the layer thickness of Foerster. Instead, Foerster discloses joining elements made of specific compounds that have a regulated porosity therethrough.

The problem of attempting to match the joining layer to the specific conditions of the shank and cutting head to be joined by varying the coefficient of the joining element across its thickness is not disclosed or suggested in the prior art. Thus, one of ordinary skill would not find an optimum value for the varying heat expansion coefficient over the thickness of the joining layer.

For the above reasons Claim 1, and Claims 4, 9, 15, 16 and 18 dependent therefrom, are distinguishable over Foerster.

The rejection of Claims 2 and 3 under 35 USC §103 as being unpatentable over Foerster have been considered.

Claim 2 further recites that "the density of the powder particles varies over the thickness of the joining layer". The Office Action states that it would be the discovering of an optimum value of a result effective variable involving only routine experimentation to vary the density of the powder particles over the thickness of the joining layer.

As discussed above, Foerster does not disclose or suggest providing a different coefficient of thermal expansion over its layer thickness, much less varying the "density of the powder particles" over the thickness of the joining layer. Thus, one cannot discover an optimum value of a result effective variable when there is no teaching of the result effective variable (variation in density) in Foerster.

Applicant's Claim 3 further recites that "the density of the powder particles within the joining layer is higher on the side of the cutting head than on the side of the tool shank". As discussed with respect to Claim 2, there is no disclosure of varying the density of the powder particles within the joining layer of Foerster, much less having the density higher on the side of the cutting head.

For the above reasons, reconsideration and allowance of Claims 2 and 3 is respectfully requested.

The rejection of Claims 4-6 and 8 under 35 USC §103 as being unpatentable over Foerster in view of Gühring, U.S. Patent No. 4 704 055 has been considered.

Gühring discloses a tool shank made from tool steel along with a titanium nitride coating.

Gühring does not disclose or suggest the concept of providing a joining layer having a different coefficient of thermal expansion over its layer thickness, much less the coefficient of thermal expansion being lower on the side of the cutting head than on the side of the tool shank as recited in Claim 1.

For the above reasons, Gühring does not address the deficiencies in the rejection of Claim 1 based on Foerster. Therefore, Claims 4-6 and 8 are allowable over Foerster and

Gühring for the reasons set forth above with respect to parent Claim 1.

The rejection of Claims 13 and 14 under 35 USC §103 as being unpatentable over Foerster in view of Gühring has been considered.

Gühring is relied upon to teach at least one helically wound flute and at least helically wound functional passage which passes through the joining layer in the direction of the cutting head.

As discussed above with respect to Claims 4-6 and 8, Gühring does not address the deficiencies of Foerster with respect to Claim 1. Therefore, Claims 13 and 14 are allowable over Foerster and Gühring for the reasons discussed above with respect to parent Claim 1.

The rejection of Claim 7 under 35 USC §103 as being unpatenable over Foerster in view of Gühring has been considered. Claim 7 is allowable for the reasons set forth with respect to Claim 1, as Gühring does not address the deficiencies of Foerster with respect to parent Claim 1.

The rejection of Claims 10-12 under 35 USC §103 as being unpatentable over Foerster in view of Nagel, U.S. Patent Publication 2002/0009340 A1 has been considered.

Nagel discloses a deep-hole drilling tool and method for manufacturing thereof which includes a drill head 12 that is preferably brazed to a drill shank 13. The drill head and drill shank can have conical seats that match for seating the parts before brazing occurs.

Nagel does not disclose or suggest providing a joining layer having "a different coefficient of thermal expansion over its layer thickness", much less "the coefficient of thermal expansion being lower on the side of the cutting head than on the side of the tool shank". Thus, Nagel does not address the deficiencies of Foerster with respect to Claim 1. Therefore, Claims 10-12 are distinguishable over Foerster in view of Nagel for the reasons set forth above with respect to parent Claim 1.

The rejection of Claim 17 under 35 USC §103 as being unpatentable over Foerster has been considered.

Applicant's Claim 17 recites that "the thickness of the joining layer corresponds to 10 to 1000 times the diameter of the powder particles".

The rejection states that it would have been obvious to select the thickness of the joining layer to correspond to 10 to 1000 times the diameter of the powder particles. Applicant notes that Claim 1 distinguishes over Foerster as discussed above with respect to parent Claim 1 and thus dependent Claim 17 is allowable.

The rejection of Claims 1, 10-12, 15, 16 and 18 under 35 USC §103 as being unpatentable over Thielen, U.S. Patent No. 5 809 854 in view of Davies, U.S. Patent No. 4 602 954 has been considered.

Thielen discloses a boring bar device and method of assembly that includes a carbide shank 11 having a V-shaped end to receive a V-shaped cutout of a chisel point 12. A shim member 15 is placed between the carbide shank 11 and the chisel point. Then the shim material is used in a brazing process to joint the chisel point to the carbide shank.

As disclosed at column 1, lines 52-58 and column 3, lines 61-67 of Thielen, the solder shim material has a layered silver/copper/silver material with the outside silver layers being approximately 45% silver content. Thus, the joining layer may have a different coefficient of thermal expansion over portions of its layered thickness due to the variation in materials. Applicant's Claim 1, however, recites "the coefficient of thermal expansion being lower on the side of the cutting head than on the side of the tool shank". This different coefficient of expansion is not present in Thielen as the same material having the same silver content is present at both sides of the solder shim member 15.

Davies discloses a metal strip having discrete particles uniformly dispersed in the strip. The strip can be used in a brazing process. At column 1, lines 32-51 and 57-60 of Davies, the metallic strip is described as containing discrete particles in a homogeneous mix of ductile metallic particles and other particles. The method in Claim 1 of Davies includes mixing the slurry to disperse the ductile metallic particles

and other particles uniformly within the cellulose derivative. Thus the metal strip of Davies would have the same coefficient of thermal expansion over its entire layer thickness and the coefficient of thermal expansion would not be lower on one side adjacent a cutting head as compared to the other side adjacent a tool shank.

The Office Action at page 8 states that it would have been obvious to "vary the coefficient of thermal expansion across the layer thickness, for the purpose of reducing the thermal stresses at the specific material interfaces" because it has been held that "discovering an optimum value of a result effective variable involves only routine experimentation".

There is no disclosure in Thielen or Davies of varying the coefficient of thermal expansion across the layer thickness of a joining layer to reduce the thermal stresses at the specific material interfaces. Instead, Thielen discloses the same properties at each interface or side as discussed above. Further, Davies discloses a homogenous metal strip. Thus, no teaching of varying the coefficient of thermal expansion over the layer thickness of a joining layer is disclosed in the prior art. Therefore, it is unclear how an optimum value can be found when the prior art does not disclose any result effective variable for the joining layer.

For the above reasons, Applicant's Claims 1, 10-12, 15, 16 and 18 distinguish over Thielen in view of Davies.

The rejection of Claims 2 and 3 under 35 USC §103 as being unpatentable over Thielen in view of Davies has been considered.

Applicant's Claim 2 recites that "the density of the powder particles varies over the thickness of the joining layer". As discussed above, Davies discloses a metal strip that is formed as a homogeneous mix of particles. Thus, the density of particles in Davies would be the same throughout the thickness of the strip.

Applicant's Claim 3 recites that "the density of the powder particles within the joining layer is higher on the side of the cutting head than on the side of the tool shank".

Once again, as discussed above, Davies discloses a uniform dispersal of particles. Thus, Davies teaches away from varying the density, much less the density on a particular part of the metal strip. In Thielen, the density is the same at the sides of the solder shim material.

For the above reasons, Claims 2 and 3 distinguish Thielen in view of Davies and withdrawal of the rejection under 35 USC §103 is respectfully requested.

The rejection of dependent Claims 4, 5 and 8 under 35 USC §103 as being unpatentable over Thielen in view of Davies and further in view of Gühring has been considered.

As discussed above, Gühring does not address the joining layer having a different coefficient of thermal expansion over its layer thickness. Therefore, Claims 4, 5 and 8 are allowable over Thielen and Davies for the reasons set forth above with respect to parent Claim 1 and allowance of Claims 4, 5 and 8 is respectfully requested.

The rejection of Claim 6 under 35 USC §103 as being unpatentable over Thielen, Davies and Gühring, and further in view of Foerster has been considered.

Foerster is relied upon to provide a case-hardening tool shank made of 0.6 to 0.9% chromium.

Claim 6 is allowable for the reasons set forth above with respect to parent Claim 1 in view of Thielen and Davies. As discussed above, Foerster does not address the deficiencies of Thielen and Davies with respect to Claim 1.

Reconsideration and withdrawal of the rejection of Claim 6 under 35 USC §103 is respectfully requested.

The rejection of Claims 13 and 14 under 35 USC §103 as being unpatentable over Thielen in view of Davies and further in view of Gühring has been considered.

As discussed above, Gühring does not address the deficiencies of Thielen and Davies with respect to parent Claim 1. Therefore Claims 13 and 14 are allowable for the reasons set forth above with respect to parent Claim 1 and withdrawal of the rejection under 35 USC §103 is respectfully requested.

The rejection of Claim 7 under 35 USC §103 as being unpatentable over Thielen in view of Davies and further in view of Gühring has been considered. Claim 7 is allowable for the reasons discussed above with respect to parent Claim 1 and withdrawal of the rejection under 35 USC §103 is respectfully requested.

The rejection of Claim 17 under 35 USC §103 as being unpatentable over Thielen in view of Davies has been considered.

Claim 17 is allowable for the reasons set forth above with respect to parent Claim 1 and withdrawal of the rejection of Claim 17 under 35 USC §103 is respectfully requested.

Non-elected Claims 19-35 have been cancelled in favor of new Claims 36-47.

Independent Claim 36 recites a cutting tool including a tool shank and a cutting head. Claim 36 further recites a brazing disk having a thickness between opposing first and second joining surfaces, the brazing disk comprising ductile brazing material and powder particles embedded in the ductile brazing material. Claim 36 further recites "the density of the powder particles varying over the thickness of said brazing disk so that the density of said powder particles is greater at one of said first and second joining faces than the density at the other of said first and second joining faces". As discussed above, the applied prior art does not disclose or suggest varying the "density" of the powder particles within the ductile brazing material, much less to differ at the joining faces of the disk.

Finally, Claim 36 recites that "due to the varying density of the powder particles, said brazing disk has a different coefficient of thermal expansion over its layer thickness and the coefficient of thermal expansion is different at the second joining face brazed to the cutting head than at the first joining face brazed to the tool shank". As discussed above, the prior art does not disclose or suggest varying the density of the powder particles over the thickness of the brazing disk, much less providing a different

coefficient of thermal expansion at the respective joining faces.

Applicant's Claim 42 recites that "the at least one brazing disk comprises first and second brazing disks". This feature is not believed present in the applied prior art.

Claims 45-47 are allowable for the reasons set forth above with respect to parent Claim 1.

Consideration and allowance of Claims 36-47 is respectfully requested.

Further and favorable reconsideration is respectfully solicited.

Respectfully submitted,

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